FINAL REPORT
Brookhaven National Laboratory
February 2008

ISO 14001:2004 ENVIRONMENTAL MANAGEMENT SYSTEM AUDIT

[Rev 0, 03/17/2008]

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EXECUTIVE SUMMARY

Purpose: The purpose of this audit was to determine whether the Brookhaven National Laboratory (BNL) Management System (EMS) at Upton, NY conforms to the ISO 14001:2004 Standard, *Environmental Management Systems—Specification with guidance for use*.

Approach: The ISO 14001:2004 standard consists of 18 elements that address environmental policy, planning, implementation, checking and corrective action, and management review. A team of two qualified, independent auditors from Pacific Northwest National Laboratory and Oak Ridge National Laboratory audited the design, implementation, maintenance, and effectiveness of the BNL EMS against the requirements of five of these elements, with a partial review of a sixth element. A copy of the audit plan is found in Attachment A.

During the course of this assessment, a representative sampling of approximately 75 managers, supervisors and staff were interviewed to enable a comprehensive, independent, and objective assessment of the conformance of the EMS to the requirements and the effectiveness of implementation. Organizations assessed included: Nuclear and Particle Physics; Light Source; Life Sciences; Basic Energy Sciences (BES), Energy, Environment and National Security (EENS); Facilities and Operations (F&O); Environmental Restoration, ESS&H; and the Director's Office. More than 117 documents and websites were reviewed. The audit concluded on February 15, and a preliminary briefing on findings was provided on that date.

Conclusions: Based on the review and areas assessed, it appears that BNL's EMS is strong, effective and among the "best in class," with a few spotty problems and vulnerabilities, which are described below.

The following table shows the distribution of findings from this EMS audit. **Major nonconformities** occur when a system element is missing or there is evidence that it is not implemented or is not effective. **Minor nonconformities** occur when there are observed discrepancies in the system, even though the overall system is defined, implemented, and effective. **Observations** are not nonconformities, but are considered issues that could lead to nonconformities if they were not addressed. An **Opportunity for Improvement** is a suggestion to improve the efficiency or effectiveness of the EMS. A **Noteworthy Practice** is performance that exceeds expectations in terms of efficiency and/or effectiveness, and provides a model for others to follow.

ISO 14001 Section	Minor Non-conformance	Observation	Opportunity for Imprvmt	Noteworthy Practice
Competence, Training & Awareness		2	2	3
Communication		1	6	13
(EMS) Documentation				
Control of Documents	1	1		
Operational Control	2	4	3	14
Emergency Preparedness & Response		2	1	2
TOTAL	**3**	**10**	**12**	**32**

Discussion: Minor Nonconformities were identified for Document Control and Operational Control. The following is a summary of all findings (including Observations and Opportunities for Improvement) during this assessment. A detailed discussion of findings by ISO 14001 element is

presented in the checklist found in Attachment B. The checklist also discusses how BNL meets other requirements, and discusses objective evidence of EMS implementation.

Competence, Training and Awareness (PARTIAL assessment):

(2) Observations: 1) 'Remedial' on the job training for inspecting regulated tanks was delivered, but was not assigned a course code nor tracked in BTMS. 2) Occupational Medicine Clinic employees hired after 02/06/06 have apparently not signed off as reviewing the Occupational Medicine Procedures and Policy Manual and procedures, and this training is not tracked in BTMS.

(2) Opportunities for Improvement: 1) As appropriate, add environmental material (e.g., examples) to Work Control Coordinator training. 2) Add Field Engineer environmental responsibilities to Environmental Restoration General Employee Training (GET-ERP) for workers. (Complete)

Communication:

(1) Observation: The Correspondence and Commitment Tracking Subject Area is unclear as to whether external environmental inquiries received informally (e.g., through a phone call) are required to be entered into the Correspondence and Commitment Tracking System. It is not clear that the system is being routinely used as required.

(6) ***Opportunities for Improvement:***

1) The SBMS subscription service is not widely used.
2) Facilitate access to information: Expand SBMS index (e.g., list Hazardous Waste Management under the letters H and W; Regulated Medical Waste under M and W; include titles of interim procedures); provide a link from EWMSD home page to reporting of environmental concerns/pollution prevention suggestions (there is already a link on the ESS&H home page); clarify in the Site Environmental Report that listed aspects are significant, and cross reference the list of aspects in Table 2-1 in Section 2.3.1 in the narrative; expand the link to "safety" on NSLS I web site to include the environment. (Complete); The webpage focused on environmental topics (http://www.bnl.gov/bnlweb/envindex.html) now redirects to http://www.bnl.gov/bnlweb/eshindex.asp, so the address could be changed in the EMS Program Description during the next update.
3) NSLS II ESSH Policy - consider changing word "policy" to "expectations" or "commitments," and then expounding on management expectations as they relate to NSLS II.
4) Share information on NSLS II comment resolution with commenters to close the feedback loop.
5) Committees are most useful when they are effective, have a clear charter, have the right people actively and regularly involved, move forward decisively with value-added solutions, grant the appropriate level of authority to subject matter experts, and there is a clear decision maker. Proceed with planned efforts to evaluate mission, focus and need for various existing committees.
6) Consider adding language to EMS Program Description stating that significant environmental aspects are communicated to external parties primarily via the Site Environmental Report.

(EMS) Documentation: ***No findings.***

Control of Documents:

(1) Minor Nonconformity: An obsolete version of an Occupational Medicine Clinic Medical Waste procedure (dated 2002) was not removed from circulation.

(1) Observation: A number of EENS Experimental Safety Review (ESR) hard copy forms reviewed in Laboratories had recently expired. In one case, an updated version had been provided to the researcher, but was not placed in the folder, despite an accompanying email advising them to replace the posted ESR with the revised Master Copy.

Operational Control:

(2) Minor Nonconformities:

1) Three failures to follow Hazardous Waste Management requirements were noted:

- One container in the BES outside shed 90 day storage area was stored over 90 days (start date 8/16/07). The completed weekly checklist did not note that the container was stored over 90 days. Note: This container was moved to hazardous waste permitted storage area in 855 the day it was discovered.

- The labels on three containers in the NSLS I 90 day storage area (all generated by one researcher) lacked an accumulation date. These items were apparently placed in the storage area after the weekly inspection. Note: The problem was detected on the next weekly inspection and corrected, and the researcher was notified of deficiency. NSLS I plans to start inspecting this area daily.

- One container of nanomaterial waste in CFN was not closed. The Managing Hazardous Waste Subject Area requires that all nanomaterial waste be managed as hazardous waste, and containers must be closed except when waste is being added or removed.

2) There was one instance of conflicting requirements or procedures: The Managing Hazardous Waste Subject Area (01/30/08 effective date) says "*manage all nanomaterials as hazardous waste*." The Interim Approach to Nanomaterial ESH Subject Area indicates that requirements for non-hazardous nanomaterial waste are contained in the industrial waste or rad waste subject area (07/31/07). Note: Delete reference to radioactive waste. If all nanomaterial is hazardous, then rad nano is a "mixed" waste.

(5) Observations:

1) Lack of systematic approach to manage vulnerability:

- There is no system/process for management of research samples that are being retained.

- Additional EMS information should be added to the Termination of Employment form (in Section 8 of Employment Subject Area). In addition, the form could be used for internal transfers as well as terminations. Suggested changes:

    - capture and arrange for transfer of key responsibilities/ownership (e.g., for systems, equipment requiring calibration, chemicals, building management, Local Emergency Coordinator, committees, updating of postings, conducting inspections, etc.)

    - require supervisor and operations (e.g., ECR/EMS Representative) sign off. Currently only the employee signs the form.

    - apply the process for long term guests and collaborators. Currently, the checklist apparently only applies to employees.

- also use the checklist for transfers (from one building/organization to another).

2) Inattention to Detail:

- An unlabelled container of liquid was in an EENS Flammable Storage cabinet in Building 815. Note: a Tier 1 was recently done in the same area. The item was believed to be soap.

- A cardboard collection container (with a clear label above it indicating the container was for recycling cardboard) in NSLS I was filled with rugs, some Styrofoam and white paper. (The container was emptied that day to prevent more additions.)

- The container label of a jug in the 90 day Occupational Medicine X-ray waste storage area in 490 indicated it was Non-hazardous Developer, in contrast to a handwritten marking that said "Fixer" (which is hazardous).

3) Some simple energy conservation measures have not been taken:

- Motion detectors in Building 860 do not work, which results in a number of lights remaining on when the building is unoccupied.

- In a hallway in Building 490, there was a large gap between two glass exterior doors right next to a ceiling heating vent.

- Several Madam Curie Dormitory windows were left wide open in bathrooms, while interior temperatures were around 70 and exterior temperatures were in the teens.

4) In the Occupational Medicine X-ray waste 90-day storage area, two five gallon jugs were stored too close to each other to allow the labels on the containers to be read. Labels on some non-hazardous five gallon jugs in Blg. 855 were not clearly visible. (The containers can be moved, but they weigh 40-50 pounds, which poses a potential for back injuries.) A requirement that labels be visible on containers of non-hazardous waste is not clear in WM-SOP-760.

(3) Opportunities for Improvement: 1) At some point, consider expanding management observation program to include environment if it does not dilute the safety focus (and include awareness examples in training.) 2) Many office printers are not capable of printing double-sided copies, and networked printers are not automatically set to double side. 3) Black/brown goo came out of several safety shower drain pipes at NSLS I. Note: A similar material was also found in the domestic water line going into NSLS I cooling system, and is being analyzed. The water coming out of the eye wash itself appeared to be clear.

Emergency Preparedness and Response:

(2) Observations: 1) The Sr-90 groundwater treatment system procedure (EM-SOP-308) does not address spills. 2) NSLS I has not considered containing/collecting potential 350 gallons of contaminated wash water that would be generated from one use of emergency shower.

(1) Opportunity for Improvement: Label Sr-90 shop vac and compressor in Building 855, and indicate in procedure how waste shop vac filters should be managed.

NOTEWORTHY PRACTICES

There were also 32 noteworthy practices:

- BTMS makes it easy to evaluate the status of required training for any individual. Many organizations like NSLS I and F&O are tracking on the job training in BTMS. The system also tracks the status of required professional certifications like those for wastewater treatment operators. Random checks did not reveal any out of date required environmental training.

- NSLS I has developed concise, informative read and sign training.

- Several organizations (CMPMSD, NSLS II) have developed good one page summaries of "rules everyone should know." **Note**: Consider adding a note on discharges to drain prohibitions if it is not already covered.

- RAISING AWARENESS AND ENCOURAGING DIALOGUE

    - BNL has a "best in class" set of Earth Day activities, including a "Pledge Tree" that promotes engagement and involvement and raises money that is donated to an environmental cause. The Pledge Tree is one of the most innovative and clever activities the Audit Team Lead has ever seen.

    - A discussion of ESH issues associated with nanomaterials was held at a Community Advisory Committee (CAC) meeting (10/11/07). The meeting was held at CFN, and included a facility tour.

    - The CAC continues to be a valuable forum with knowledgeable stakeholders.

    - The Life Sciences NASA research support group mentors 500+ users each year.

    - The BES Associate Laboratory Director sent out an email to all directorate staff communicating the FY08 EMS objectives/targets and asking for their support and comments.

    - F&O has implemented an ESH concerns form that can be filled out anonymously. Concerns are documented and follow up is tracked.

    - The Annual Laboratory Plan and associated performance summaries communicate priorities (including environmental and emergency management) simply and clearly.

    - The Lab level EMS Management Review was logical, structured, discriminated on issues, and risk oriented. Unlike ORNL, PNNL, and INL, BNL also does organization-level Management Reviews, which help inform and engage mid-level management.

    - Some organizations are trending Tier I and waste generation data (NSLS I).

    - BNL held a brown bag on plans to addle geese eggs to control populations of resident Canada Geese. This demonstrates the lab has the courage to work through difficult and somewhat controversial communication issues associated with geese (and deer) population control.

- Groundwater functions for compliance and remediation have been fully integrated.

- The Environmental Restoration program has developed a procedure (1.10) on Communications Formality. NOTE: The procedure does not mention CCTS, but will be revised to include it.

- In pre-bid meetings with contractors, Environmental Restoration management emphasized the importance of work planning and control. They have also incentivized waste reduction (e.g., reduction of waste graphite packages). The BGRR contractor will be re-using contaminated equipment.

- REQUIREMENTS:

  - There is a section addressing Offsite work in the Work Planning and Control for Experiments and Operations Subject Area. This procedure describes a graded approach to work planning /BNL review based on the type of offsite facility.

  - Scientific experts and environmental staff team with other to develop approaches and controls (e.g., for nanomaterials and mercury contamination.)

- REVIEWS:

  - An auditor observed a robust Experimental Safety Review process in CFN, with strong participation from the ECR, ESH Coordinator, Safety Rep, and Principal Investigator. In EENS, the Chair also participates.

  - A preventive maintenance/inspection program was instituted in Plant Engineering for hydraulic equipment brought onsite by contractors. One manager noted that, as a result, “contractors don’t send crappy equipment to BNL anymore.”

  - A thorough environmental review was conducted of NSLS II design.

  - The Occupational Medicine Clinic updates their process assessment for Medical X-rays annually, and trends waste generation.

- TOOLS:

  - NSLS I has summarized nanomaterial requirements in a concise format. EENS has developed a self-assessment checklist for nanomaterial requirements. (**Note**: Consider incorporating both into the Subject Area as guidelines/tools.)

  - Physics maintains an electronic map showing rooms with satellite accumulation areas and 90-day accumulation areas.

  - Physics maintains Experimental Safety Reviews electronically (online).

- CONTROLS AND PROGRAMS TO REDUCE ENVIRONMENTAL IMPACT

  - Despite the unknowns, BNL has put proactive nanomaterials controls in place to collect and manage wastewater and to direct air through HEPA filters.

  - Additional air emission controls were put in place to minimize emissions from BLIP.

- Several new buildings (RSB and CFN [735]) will be LEED (silver) certified.
- Chemistry has set up a chemical redistribution service that reduces waste and chemical purchasing costs.
- Invasive Phragmites (Common Reed) along the Peconic is being controlled.

- NSLS I has held good drills with environmental consequences, with good lessons learned.
- Life Sciences has developed an electronic fire alarm/drill report which provides for corrective action tracking. Consider for Lab-wide use.

AREAS SUGGESTED FOR FURTHER INQUIRY IN FUTURE ASSESSMENTS/EMS AUDITS

- Evaluate operational controls for natural resource usage, environmental noise and cultural resources.
- Elements not assessed in the past two years.
- Elements for which the status of conformance is not well understood, those with new requirements, and those for which significant corrective/preventive actions have been undertaken (to assess effectiveness.)

AUDIT PROCESS

During the internal audit, interviewees were extremely cooperative and helpful. Turnaround on documents or information requested was speedy. Some items of concern were corrected the same day.

In terms of process improvements for future assessments, ready access to the Intranet (to review SBMS and internal operating procedures during the desk audit and while onsite) would be helpful. Also, auditors should consider requesting a list of projects to select some with significant aspects for review.

ATTACHMENTS:

- **Attachment A – Final Audit Plan**
- **Attachment B - ISO 14001 Checklist**

ATTACHMENT A – FINAL AUDIT PLAN, 01/16/2008

ATTACHMENT B – ISO 14001 EMS AUDIT CHECKLIST